Impact of Pedal Arch Reconstruction on Limb Salvage and Wound Healing

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Disclosure

Speaker name: Young-Guk Ko

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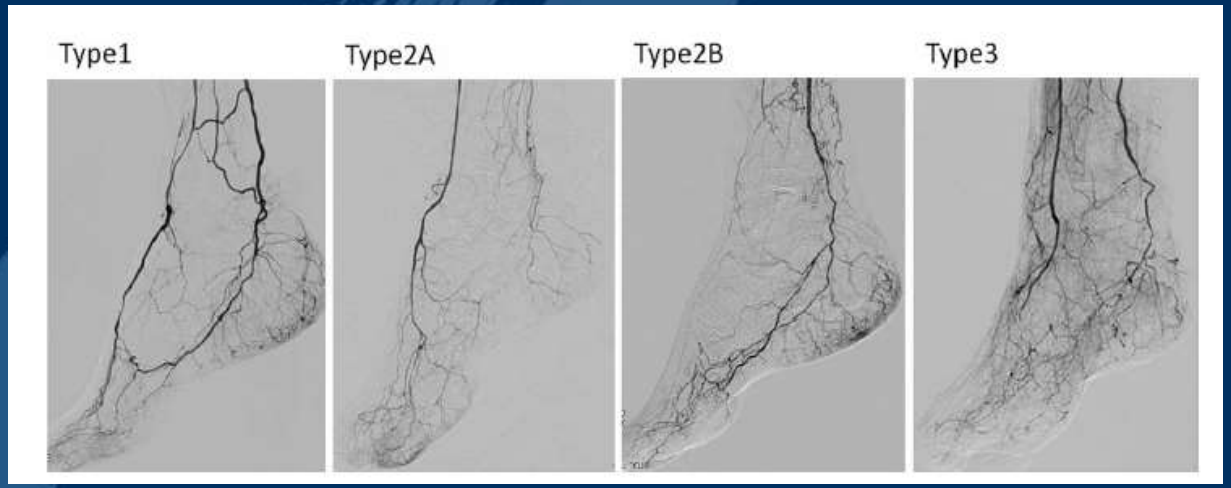
I have the following potential conflicts of interest to report:

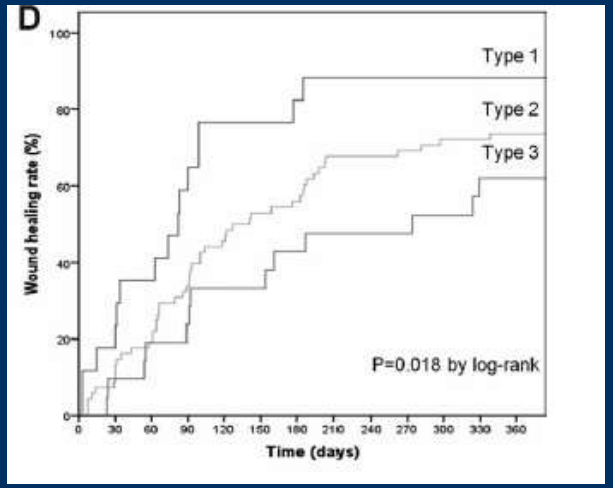
- ☐ Consulting
- ☐ Employment in industry
- ☐ Stockholder of a healthcare company
- ☐ Owner of a healthcare company
- ☐ Other(s)
- ☑ I do not have any potential conflict of interest

Background

- Revascularization is the cornerstone of CLI treatment for limb salvage and better wound healing.
- Direct revascularization to ischemic wound based on the angiosome concept achieved better wound healing.
- However, the angiosome concept still remains controversial due to overlap of of angiosomes and individual variability of vessel anatomies.
- Preserved pedal arch has been also shown to be an important factor for wound healing.

Pedal Arch Type and Wound Healing





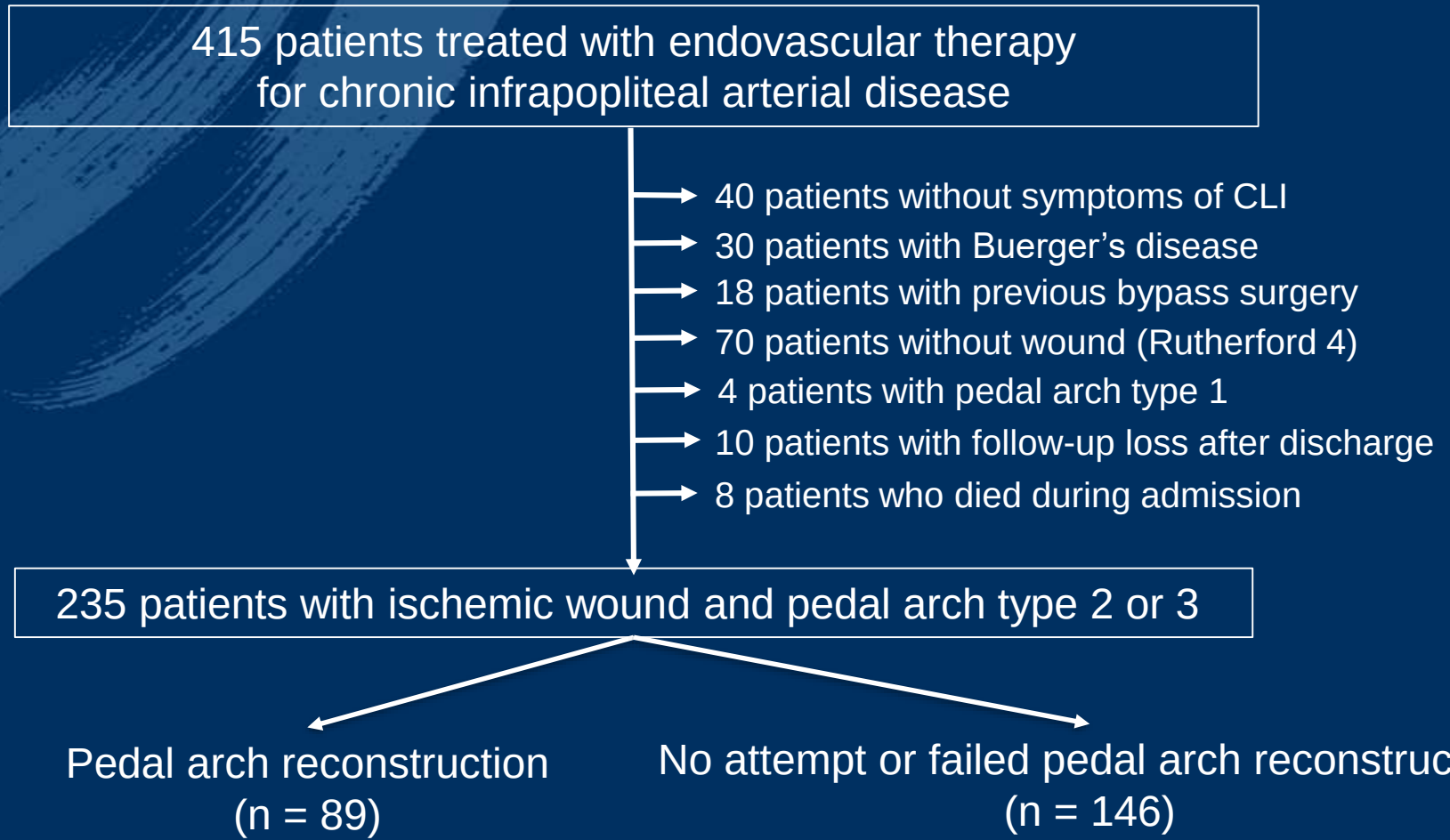
Kawarada O,
Catheter Cardiovasc Interv 2012;80:861

Study Purpose

- To investigate the impact of endovascular reconstruction of the pedal arch on wound healing in patients with CLI.

Patient Selection

Between 2009 and 2016
at Severance Cardiovascular Hospital



Baseline Clinical Data

	Total (n=235)	PAR (n=89)	Non-PAR (n=146)	P
Male	179 (76.2)	67 (75.3)	112 (76.7)	0.803
Age, year	67.2 ± 10.3	68.5 ± 9.6	66.4 ± 10.7	0.132
BMI, kg/m^2	22.5 ± 3.4	22.9 ± 3.2	22.1 ± 3.5	0.081
Hypertension	176 (74.9)	67 (75.3)	109 (74.7)	0.915
DM	203 (86.4)	76 (85.4)	127 (87.0)	0.730
Hypercholesterolemia	104 (44.3)	43 (48.3)	61 (41.8)	0.328
CKD	97 (41.3)	30 (33.7)	67 (45.9)	0.066
ESRD	74 (31.5)	22 (24.7)	52 (35.6)	0.081
CAD	93 (39.6)	33 (37.1)	60 (41.1)	0.541
Stroke	22 (9.4)	10 (11.2)	12 (8.2)	0.441
Smoking	122 (51.9)	51 (57.3)	71 (48.6)	0.197
Previous angioplasty	58 (24.7)	22 (24.7)	36 (24.7)	0.992
Rutherford category				0.957

Wound Data

	Total (n=235)	PAR (n=89)	Non-PAR (n=146)	P
Wound character				0.650
Ulcer	118 (50.2)	43 (48.3)	75 (51.4)	
Gangrene	117 (49.8)	46 (51.7)	71 (48.6)	
Wound location				0.244
Toes	180 (76.6)	68 (76.4)	112 (76.7)	
Dorsal	9 (3.8)	2 (2.2)	7 (4.8)	
Plantar	4 (1.7)	2 (2.2)	2 (1.4)	
Heel	18 (7.7)	11 (12.4)	7 (4.8)	
Above ankle	2 (0.9)	0 (0)	2 (1.4)	
Multiple	22 (9.3)	6 (6.7)	16 (11.0)	
Wound infection	68 (28.9)	29 (32.6)	39 (26.7)	0.336
WIfI score	3.6 ± 1.5	3.7 ± 1.4	3.6 ± 1.5	0.672

Target Vessels

	Total (n=235)	PAR (n=89)	Non-PAR (n=146)	P value
Number of runoff vessels				0.274
0	144 (61.3)	59 (66.3)	85 (58.2)	
1 or 2	91 (38.7)	30 (33.7)	61(41.8)	
Total occlusion	170 (72.3)	62 (69.7)	108 (74.0)	0.474
Lesion length, cm	29.7 ± 12.7	30.7 ± 16.1	27.6 ± 15.2	0.322
Infrapopliteal target vessel				
Anterior tibial artery	194 (82.6)	78 (87.6)	116 (79.5)	0.109
Posterior tibial artery	140 (59.6)	57 (64.0)	83 (56.8)	0.276
Peroneal artery	58 (24.7)	22 (24.7)	36 (24.7)	0.992
Multiple infrapopliteal target vessels	146 (62.1)	64 (71.9)	82 (56.2)	0.016

Angioplasty Techniques

	Total (n=235)	PAR (n=89)	Non-PAR (n=146)	P value
Attempted BTA angioplasty	122 (51.9)	100 (100.0)	50 (34.2)	<0.001
Subintimal approach	88 (37.4)	47 (52.8)	41 (28.1)	<0.001
Pedal-plantar loop technique	30 (12.8)	24 (27.0)	6 (4.1)	<0.001
Transpedal approach	1 (0.4)	0 (0)	1 (0.7)	1.000
Transcollateral approach	3 (0.9)	0 (0)	3 (1.4)	0.527
Bail-out stenting	24 (10.2)	15 (16.9)	9 (6.2)	0.009

Immediate Outcomes

	Total (n=235)	PAR (n=89)	Non-PAR (n=146)	P value
Direct flow	148 (63.0)	80 (69.2)	43 (48.9)	<0.001
Pre pedal arch type				0.014
2	145 (61.7)	46 (51.7)	99 (67.8)	
3	90 (38.3)	43 (48.3)	47 (32.2)	
Post pedal arch type				<0.001
1	58 (24.7)	58 (65.2)	0 (0)	
2	123 (52.3)	31 (34.8)	92 (63.0)	
3	54 (23.0)	0 (0)	54 (37.0)	
Pre ABI	0.69 ± 0.30	0.73 ± 0.33	0.65 ± 0.27	0.123
Post ABI	0.88 ± 0.22	0.89 ± 0.23	0.88 ± 0.27	0.822

Complications

	Total (n=235)	PAR (n=89)	Non-PAR (n=146)	P value
Puncture site hematoma	11 (4.7)	4 (4.5)	7 (4.8)	1.000
Vascular rupture	11 (4.7)	3 (3.4)	8 (5.5)	0.541
Flow-limiting distal embolization	0 (0)	0 (0)	0 (0)	-
Complications requiring surgery	1 (0.9)	1 (1.1)	1 (0.7)	1.000

Medication

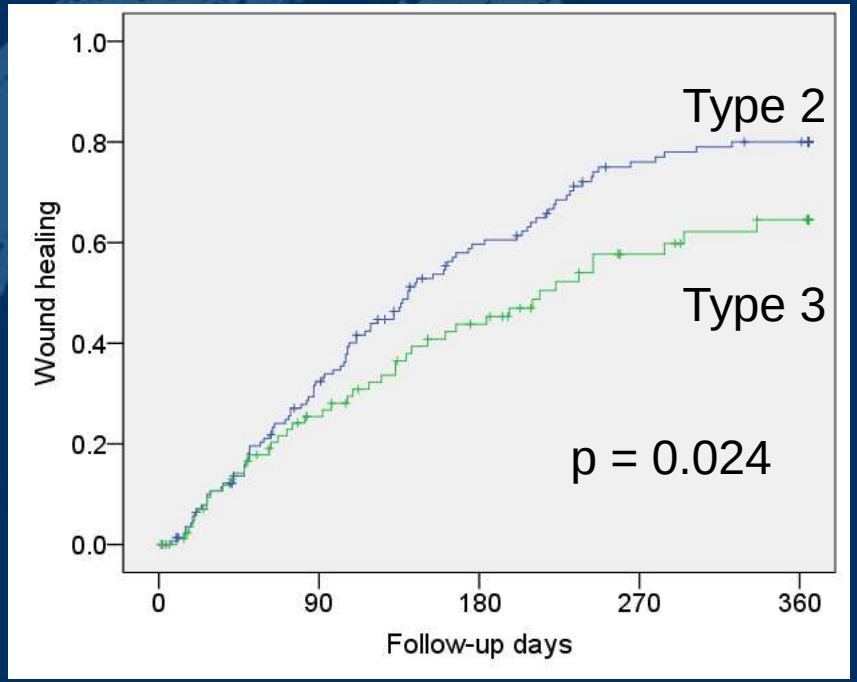
	Total (n=235)	PAR (n=89)	Non-PAR (n=146)	P
Aspirin	195 (83.0)	73 (82.0)	122 (83.6)	0.761
Clopidogrel	194 (82.6)	74 (83.1)	120 (82.2)	0.852
Aspirin + clopidogrel	163 (69.4)	61 (68.5)	102 (69.9)	0.831
Cilostazol	54 (23.0)	23 (25.8)	31 (21.2)	0.415
Statin	167 (71.1)	64 (71.9)	103 (70.5)	0.823

Clinical Outcomes at 12 Months

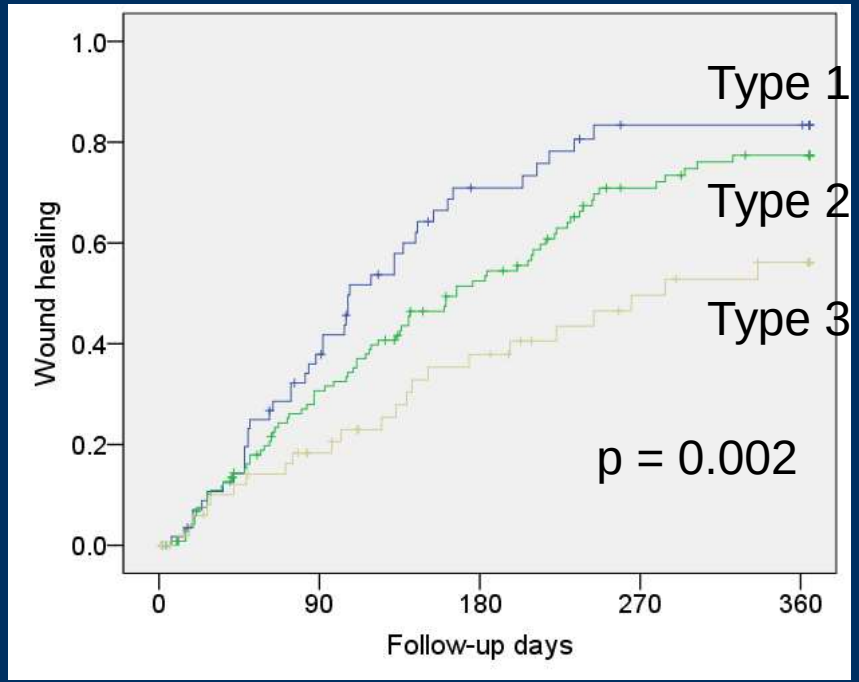
	Total (n=235)	PAR (n=89)	Non-PAR (n=146)	P value
Overall survival	90.6%	87.2%	92.6%	0.337
Freedom from major Amputation (Limb salvage)	91.0%	96.4%	87.8%	0.031
MALE	76.0%	80.7%	73.1%	0.163
Freedom from reintervention	84.1%	82.6%	85.0%	0.644
Wound healing	74.6%	81.2%	70.2%	0.015

Wound Healing

Pre Pedal Arch Type

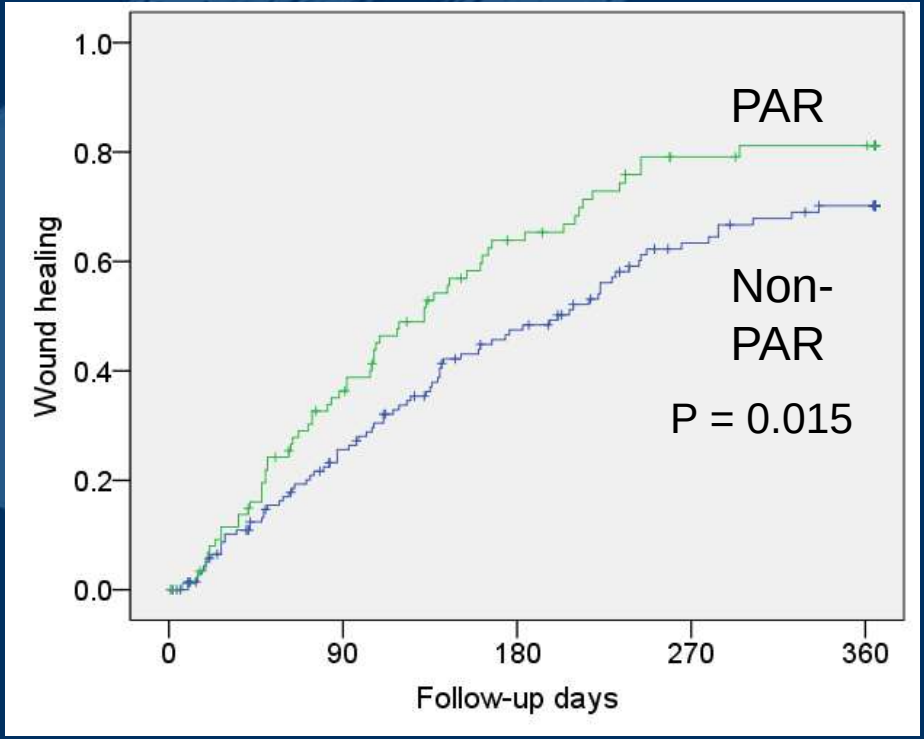


Post Pedal Arch Type

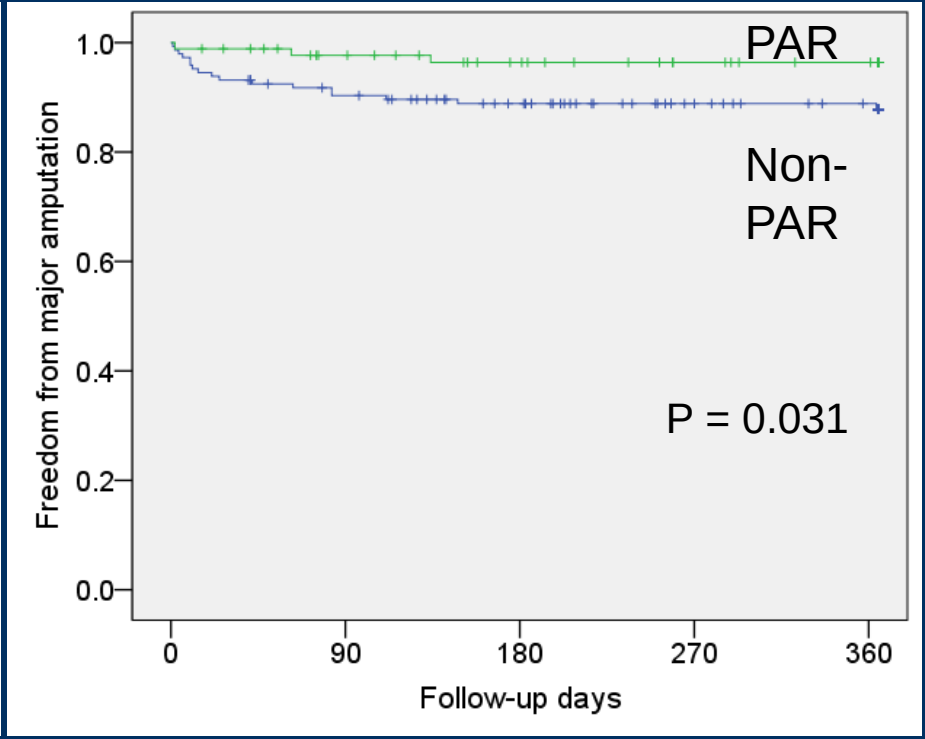


Pedal Arch Reconstruction

Wound healing



Freedom from Major Amputation



Predictors of Wound Healing

	Univariate analysis		Multivariate analysis	
	HR (95% CI)	p	HR (95% CI)	p
Hypertension	0.757 (0.524 - 1.093)	0.137	0.772 (0.530 – 1.125)	0.177
Gangrene	0.642 (0.461 – 0.893)	0.008	0.659 (0.471 – 0.923)	0.015
CRP > 3 mg/dL	0.996 (0.990 – 1.001)	0.123	0.591 (0.386 – 0.904)	0.015
Pre type 3 pedal arch	0.668 (0.470 - 0.950)	0.025	0.628 (0.431 – 0.916)	0.016
Pedal arch reconstruction	1.499 (1.078 - 2.084)	0.016	1.564 (1.068 – 2.290)	0.022
Direct flow	1.363 (0.958 – 1.939)	0.085	1.127 (0.747 – 1.699)	0.570

Study Limitations

- Single center retrospective study with intrinsic limitations related to study design.
- The status of tissue perfusion was not evaluated before and after the procedure.
- The treated vessels were not rigorously followed for durability of the patency using imaging studies

Conclusions

- Gangrene, high CRP, absence of a pedal arch, and pedal arch reconstruction were independent predictors for wound healing after endovascular therapy in patients with CLI.

- Thus, efforts should be made to revascularize the pedal arteries, especially when the pedal arch is completely absent.


Thank You for Your Attention!

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